Radio Receiver R-100/URR, The "Troop Morale Receiver"

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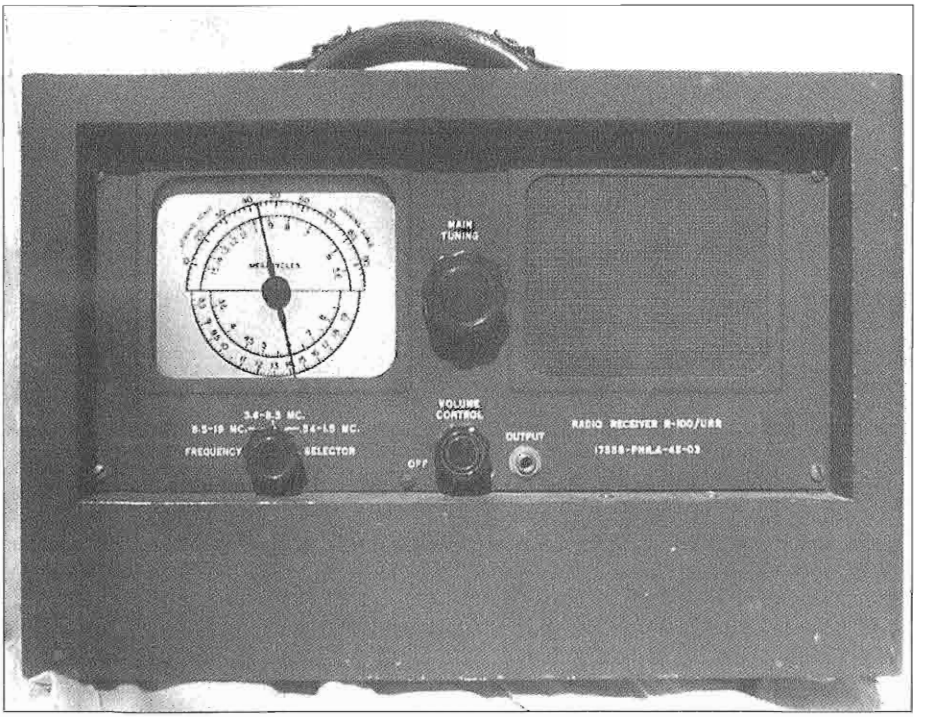
As I write this short article, I am listening to a local AM broadcast station which is advertising one of the many web-based or "Wi-Fi Radios" which enable the listener to "tune in" any of hundreds of on-line streams from radio stations around the world. Of course, on-line streaming is nothing new, but it is a relatively recent development. Debate continues as to whether the Internet will destroy shortwave broadcasting (or for that matter all over-the-air broadcasting). Admittedly, it is a little alarming to note the continuing decline of the "big guns" such as the BBC and the Voice of America, and every monthly issue of *Monitoring Times* seems to bring news of yet another shortwave broadcaster leaving the air. Where all of this will take us remains to be seen, but one constant remains: the Internet and satellites are vulnerable to natural hazards and human intervention, but even at the bottom of a sunspot cycle shortwave broadcasts are always audible on *some* frequency, day or night.

In listening to my favorite local AM talk station in Phoenix, it is not uncommon for the host to mention that our men and women serving around the



The R-100/URR "troop morale" receiver was produced during World War II in moderately large quantities by several contractors.

world are listening to real-time streaming of their home town stations while in the field. This seems to make a 35-pound portable broadcast band/shortwave receiver a real anachronism, however, 64 years ago this piece of gear probably ranked right after a hot meal and a letter from home. My father tells of spending 36 months in the South Pacific during World War II, always waiting for letters from home and *any* news from the outside world. He says that he does not remember ever seeing an R-100, but he tells of receiving a couple of very welcome battery-powered radios sent by civilians in the States.

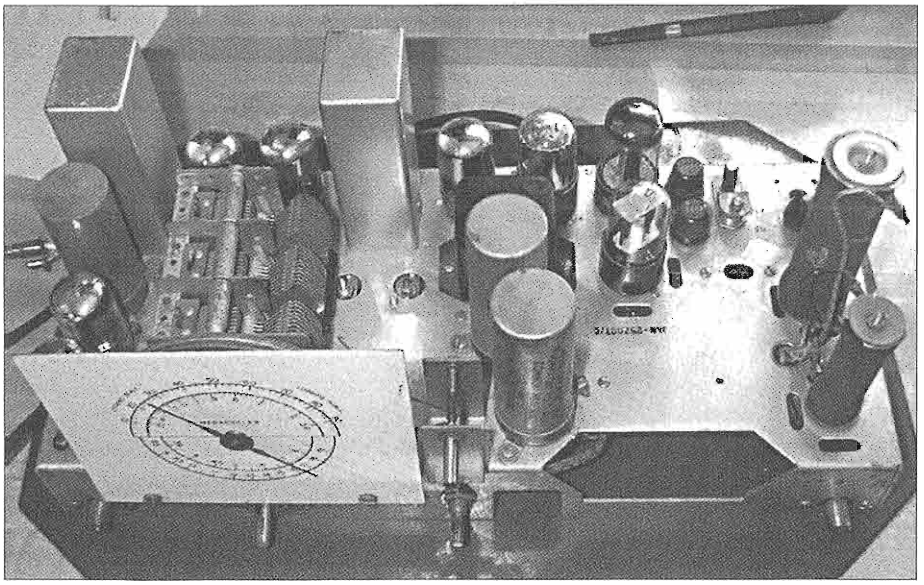
Anyone who has served in the military knows the sense of isolation which comes from not knowing what is going to happen next, or what is happening in the outside world. Combat duty consists of days or weeks of boredom punctuated by days or weeks of sheer terror. This is true of all wars, and it was particularly true of World War II. Far-flung operations made news from home a most important commodity. Military censors deleted references to anything which could possibly be of use to the enemy in both inbound and outbound mail. Keeping troops sharp, maintaining security, and combating boredom is a problem of which the United States military was acutely aware. One of the answers was the so-called "Troop Morale Receiver." The "Radio Receiver R-100/URR" is the subject of this brief paper.

The decade of the 1930s saw truly spectacular growth and developments in radio communications. By the end of the decade, one was hard pressed to purchase a radio receiver of any type which did not include the shortwave bands. Pick up a copy of Hugo Gernsbach's *Short Wave Craft* and read the articles about the latest and greatest shortwave antenna, converter, or receiver. It seemed that *everyone* was listening to shortwave broadcasts.

The US military was a little slow to catch on to all of this. The use of radios in World War I was very limited. Obviously, the state of the art was primitive at best, and shortwave broadcasting had yet to make its appearance. The short waves were unknown to all but a few dreamers, and even they had no idea of the enormous distances over which radio signals would propagate. The normal reluctance of Congress to spend money on the military during peacetime further contributed to the slow development of radio communications. Military communications, up to December 7, 1941, were predominately teletype and voice over wire. In reading the three-volume history of the Signal Corps noted below, I was struck by the notion that a modest ham station in 1941 probably rivaled or even exceeded the best shortwave communications capability of the U.S. military in terms of the ability to communicate reliably. Field commanders and top military brass simply didn't see the need for a far-flung network of radio relay stations. Commercial interests did, however. One simple development forced the military to adopt radio communications: *long-range aircraft*. Of course, war on a global scale does tend to severely limit the use of wire-based communications.

In the years leading up to World War II, the idea of "troop morale" receivers probably did not occur to the Signal Corps and in fact, no truly portable military radio equipment of *any kind* existed until very nearly the outbreak of hostilities in 1941. The definitive work on this subject is the three-volume set I mentioned earlier about the U.S. Army Technical Services.[1]

In any military unit, be it ground troops, aircraft, or ships, the radio operator is the man through whom virtually all communications flow. Unfortunately for the rest of the men and women, much of what the radio operator hears is either classi-



Here is a top-front view of the 9-tube R-100/URR receiver, out of its cabinet.

fied or of little interest to the average soldier. Hanging around the radio shack was, however, a favorite pastime. Virtually every piece of comm gear was able to tune from 1500 kHz to at least 18 MHz, (generally missing 550 – 1500 kHz!) and I'm sure the many movies which date from the period reflect at least a measure of truth when we see the radio operator tune to "Tokyo Rose" or "London." Obviously, the Signal Corps, and in particular the USO, knew of this. Whose idea it was to build a radio just for entertainment I have been unable to discover, but I have learned that posing the question to the readers of Electric Radio Magazine is likely to result in a very good learning experience for the writer!

The R-100/URR formed part of a complete entertainment system; part of which was the AN/TIQ-2 Public Address Set which permitted the R-100 to be played for large groups. One can imagine USO or simply open-air settings near the front lines. A vibrator pack "PP-31( )TIQ-2 provided B+ in the event that AC power or batteries for the 90V B+ were not present. And, if you were in a very lucky outfit, you might have had the PE-214-A gasoline engine generator to power your R-100 and AN/TIQ-2. All of this information is to be found in Training Manual 11-310.

The R-100 is a three-band, "tri-power," AM-only receiver. Unlike most military receivers from WWII, this one covers the broadcast band. Of course, it was intended for recreation and not communications. The band arrangement is as follows:

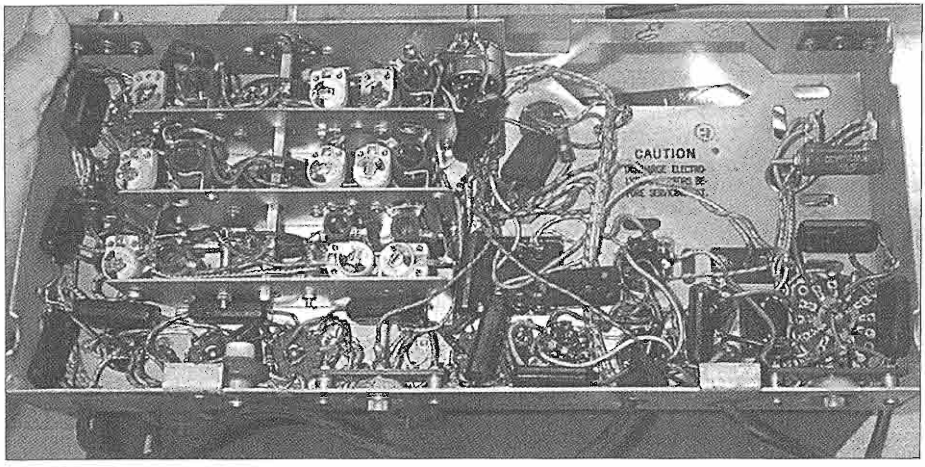
Band 1: .540-1.5 Mc
Band 2: 3.6-8.5 Mc
Band 3: 8.5-19 Mc

There is a small amount of overlap at each end so that there are no gaps between 3.6 Mc through 19 Mc and almost 20 Megs with the overlap.

The tube complement consists of:

- 1LN5 RF Amp
- 1LC6 Converter
- 2 each, 1LN5 IF Amplifiers
- 1LH4 Detector/1ST AF
- 25L6GT AF Amp (for AC operation)
- 3Q5GT AF Amp for battery operation
- 25Z6GT Rectifier (for AC operation)

For those not familiar with loktal tubes,



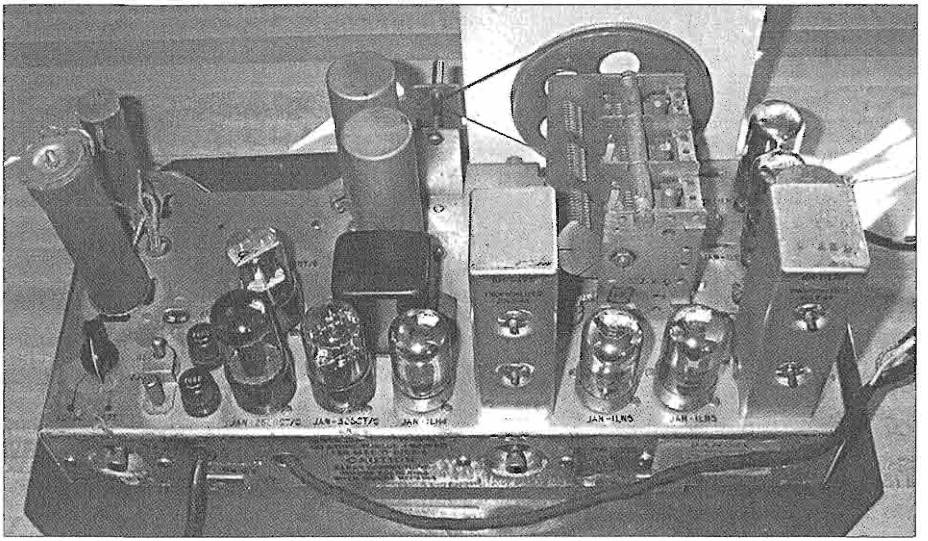
Looking underneath the R-100 chassis shows typical multiband receiver construction of the period. Each bandswitched stage has its own shield partition and the wiring harness is neatly laced in the traditional manner.

they were a short-lived, lock-in design intended to prevent vibration from loosening tubes. My personal experience is that anything from 01As forward require more than rough handling to loosen tubes from their sockets. The loktal seems to have been a solution looking for a problem. While often maligned, in my 45-plus years of tinkering with radios, I have never found a bad loktal (short of physical damage). The bright silver getter makes them quite attractive to look at as the photos will attest. The biggest objection was apparently that the pins are so small that they made poor contact. This doesn't hold water when the miniature tubes which closely followed them with approximately the same pin diameter are considered!

The user had the choice of AC power of either 115V or 230V, or battery power consisting of battery packs BA-36 (two each, 45V in series) and BA-203/U (two each, 6V in series) which provided the necessary 12V DC and 90V DC for filaments and B+. The radio is a "transformerless" design. A stern warning is silk-screened on the voltage selector access door not to let a ground connection (or human fingers) come into contact with the chassis, RF ground being provided through a .005-µF, 600-volt capacitor. Looking at the photo of the chassis top, page 4, two large power resistors are quite obvious: A 220-ohm, 30-watt resistor and a 260-ohm, 60-watt resistor provide the necessary voltage drops for the 25L6. Another stern warning against operating with AC with batteries installed is prominent on the access door. Exploded B batteries are messy!

As mentioned earlier, the R-100 was intended for nontechnical personnel. A glance at the front panel controls reveals three controls and a headphone jack. "On-Off/Volume," "Main Tuning," and "Frequency Selector" comprise (with the dial) the front panel. Obviously, no BFO is included. Although MCW was very common during World War II, this radio was definitely aimed at the Tommy Dorsey crowd!

The receiver is quite heavy—on the order of 35 pounds with batteries installed. The front panel is recessed about an inch which was clearly an attempt to prevent the controls from being sheared off during rough handling, although I can't imagine that GIs ever handled equipment in a rough manner. There



The top rear-chassis view shows very little corrosion on the chassis in the 64 years that have passed since it was built.

were the remains of a carrying handle, which I replaced with a unit from Antique Electronic Supply which fits perfectly and seems appropriate for the time period. I have not seen handles on any photographs of R-100s, but the handle on this one was obviously installed professionally. It is exactly centered and square with the cabinet. It was riveted with the proper tools; so it may be original to the radio, or perhaps some enterprising Special Services sergeant had it installed in a military machine shop.

The under-chassis view, page 5, illustrates the use of high-quality components. All of the trimmers are ceramic. No mica compression trimmers were used here. The tight lacing and neat layout, so common in commercial radios, is evident. There is no manufacturer's label. Thanks to Chuck Teeters (W4MEW) for pointing out that if Zenith had manufactured this unit, the wire insulation would be rubber. This radio has fabric "push-back" insulation. Since the radio has been fungus-proofed and it performs so well, I have not replaced any resistors. I am sure that some or all of them have risen in value, but the radio's performance gives no hint of seriously out-of-spec components.

In conclusion, one cannot point to this receiver as being particularly attractive. It is heavy, bulky, and certainly lacks any of the sophistication of communications equipment being manufactured at the same time. In fact, it is little more than a heavy duty cousin to a Zenith Trans-Oceanic, but its fellow receivers probably brought just a little enjoyment to men and women stationed in very remote; dangerous, and lonely places.

Footnotes:

1. Office of the Chief of Military History, The Technical Services, Vol. I, "The Emergency" Vol. II, "The Test," Vol. III, "The Outcome," U.S. Army in World War II, United States Army, Washington, DC, 1956

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